



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Energy savings

The client as change agent

Haugbølle, Kim; Bertelsen, Niels Haldor

Published in:

Proceedings of the 2008 World Sustainable Building Conference SB08, Melbourne

Publication date:
2008

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Haugbølle, K., & Bertelsen, N. H. (2008). Energy savings: The client as change agent. In G. Foliente, T. Lützkendorf, P. Newton, & P. Paevere (Eds.), *Proceedings of the 2008 World Sustainable Building Conference SB08, Melbourne* (Vol. 2, pp. 1595-1602). CSIRO Publishing.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

ENERGY SAVINGS: THE CLIENT AS CHANGE AGENT

Kim HAUGBØLLE PhD¹
Niels Haldor BERTELSEN PhD²

¹ Danish Building Research Institute, Aalborg University, Hørsholm, Denmark, khh@sbi.dk

² Danish Building Research Institute, Aalborg University, Hørsholm, Denmark, nhb@sbi.dk

Keywords: client, users, innovation, network, energy, public policy

Summary

This study will show that clients **can** act as change agents in order to reduce the energy consumption in buildings, but not all strategies are equally successful and appropriate. In recent years, the construction client has been called upon by policy makers, the architectural, engineering and construction industry (AEC) and the clients themselves to become a change agent that can stimulate the required reduction of CO₂ emissions. Despite these calls for action, little is known about **how** clients can make a difference as change agents. Consequently, this study will critically assess the impact and success of the various strategies deployed by a group of Swedish clients and building owners forming a strategic innovation network in order to become change agents in construction and real estate. Based on documentary analysis and interviews, the analysis will draw on a combination of innovation theories dealing with the role of users, various constructivist approaches on the co-construction of technologies and users along with studies on procurement and the role of clients in changing the construction and real estate cluster.

1. Background

In Europe, 40 % of the total energy consumption is related to buildings. A number of public policies have been implemented in the European countries to reduce the total energy consumption (AID-EE EU project 2006b & 2006c). Despite the impact of these public policies, it has also become clear that further actions from the construction industry itself are necessary to achieve the desired goal of reducing CO₂ emissions. However, it is widely recognized that the construction industry suffers from a low level of innovation. Thus, in recent years the client has been called upon by policy makers, the AEC (Architectural, Engineering and Construction) industry and the clients themselves to become change agents that can stimulate the required reduction of CO₂ emissions.

These calls are now manifesting themselves in various forms like the governmental building policy for public clients in e.g. Denmark and the Netherlands, the revaluing construction initiative of CIB and the establishment of the International Construction Clients Forum (ICCF) as well as a similar network for public real estate owners (PURE-net). Despite these calls for action, little is known about **how** clients in practice can make a difference as change agents.

This study will analyze how a group of Swedish clients and building owners have attempted to become a collective change agent by forming a strategic innovation network named BELOK in order to reduce energy consumption in commercial facilities. Further, the study will critically assess the impact and success of the various strategies deployed and the tools developed by the strategic innovation network of clients.

2. Research design

The research design of this study includes data from two main sources. First, this study is based on an analysis of a range of documentary sources: Public policy documents, strategic policy documents of the organization, minutes from steering committee meetings 2001-2007, the internal and the external part of the website of the organization as well as reports, articles and tools from various research and development projects initiated by BELOK.

Second, this study is based on five evaluation meetings held from August to October 2007 with 2-10 participants and representing 3 BELOK members, 4 from the BELOK administration (chairman, coordinator, Swedish Energy Agency and the Swedish Construction Clients Association), 5 other members in the BELOK Committee and 4 participants in BELOK projects. The evaluation meetings were supplemented with informal correspondence by email with the secretariat of BELOK as well as the coordinator and the chairman of BELOK. Last, the pre-conclusion was presented at the BELOK steering committee meeting 12 October 2007 and at the BELOK meeting no. 29 on 14 November 2007, both in Stockholm.

3. Theoretical framework

If we scrutinize the slogan of 'the client as change agent' closer, the three keywords of the slogan will point at key issues and research questions dealt with in different strains of theoretical and empirical studies:

- The keyword 'client' may translate in to the field of 'construction procurement' dealing with issues related to e.g. procurement systems, contractual arrangements, trust and conflict resolution.
- The keyword 'change' may translate in to the field of 'innovation' dealing with issues related to the nature of innovations, drivers of innovation, innovation process and innovation systems.
- The keyword 'agent' may translate in to the field of 'agency' dealing with the dualism of actors and structures in relation to the role as users, clients and stakeholders.

Consequently, the analysis will draw on a combination of insights from these three specialized fields of inquiry. More specifically, the study will draw on a combination of innovation theories dealing with the role of users most notably the concept of lead users, various constructivist approaches on the co-construction of users and technologies, and the role of clients in changing the construction industry as dealt with by the CIB Task Group 58 and the literature on construction procurement.

3.1 Construction procurement: the role of the client

For the past 20 years or so, the Working Commission WO92 on Procurement Systems within the International Council for Research and Innovation in Building and Construction (CIB) has discussed the issue of construction procurement. The focus of WO92 has largely been on the proper design of procurement systems so as to ensure the best performance of the building.

In 1999, the present coordinators of WO92 (Rowlinson & McDermott eds. 1999) edited a thorough overview of procurement systems. First, the collection describes the background of WO92 and introduces the key issues, which have emerged through time like procurement strategies and systems, contractual arrangements, forms of contract and the nature of the construction process. The second part deals with organizational issues in procurement systems with a focus on e.g. the client organization, strategic briefing, value management, organizational design and project success factors and organizational learning. In the third section, emergent issues in procurement systems are approached like the importance of culture, sustainability and the use of new web-based technologies. Finally, the anthology deals with procurement systems in practice in relation to partnering as well as methods and criteria for evaluating and selecting contractors.

While WO92 has largely focused on the proper design of procurement systems so as to ensure the best performance of the building, attention has increasingly been turned towards using procurement to stimulate innovation for example as an element in a public demand-oriented innovation policy (see e.g. Edler & Georghiou 2007). Manseau & Seaden (eds. 2001) sampled an international collection of papers and studies from CIB Task Group 35 focusing on how public policies can stimulate and support innovation in construction.

Most notable internationally is the establishment of the CIB Task Group 58 on client and construction innovation and the 'clients driving construction innovation' conferences in Australia (see e.g. Brown et al. 2005 & 2006). Despite the quality of the individual papers, most of the contributions tends to focus on the subject matter e.g. information and communication technologies, sustainability or performance assessment rather than discussing the concept of the client and how clients act as change agents.

In Sweden, the Swedish Association of Construction Clients has been highly engaged in developing projects and programs to gain experiences with the client as a change agent. In 1997, the Swedish Academy of Engineering Science in collaboration with leading building owners and clients published a highly influential study on organizational competences for clients. The report (IVA 1997) suggests that the client must maintain a broad spectrum of competences in order to manage planning, execution and operation of a building. The report (IVA 1997) goes on to identify the competences needed by a client in order to handle the relationship with the owner, the customer, society and the building sector.

3.2 Innovation management: the client as user

According to Dodgson, Gann & Salter (2002), the literature on innovation management has dealt with four questions. First, researchers have analyzed the nature of innovation activities by asking questions on whether innovations are radical/incremental, continuous/discontinuous, has transience in its effects on existing ways of doing things, changes over life-cycles, are modular/architectural (systemic), results in dominant designs, or is sustaining/disruptive. Second, other approaches consider the sources of innovation which can broadly be grouped in the science-push model, the demand-pull model, and the coupling model. Third, approaches related to analysis of the innovation process include the chain-linked model, the innovation journey, and various innovation management approaches focusing on organizational integration, technology strategies and knowledge management. Fourth, approaches concerned with innovation systems has focused on systems of innovation on a national, regional, sector and technological level, analyses of networks to which firms belong, and the integration of complex product systems.

Within the demand-pull model, von Hippel (1986) has been highly influential in showing the importance of users in the development of new technologies. Von Hippel (1986: 791) has in particular introduced the concept of lead users:

"Lead users are users whose present strong needs will become general in a marketplace months or years in the future. Since lead users are familiar with conditions which lie in the future for most others, they can serve as a need-forecasting laboratory for marketing research. Moreover, since lead users often attempt to fill the need they experience, they can provide new product concept and design data as well."

Another important concept introduced by von Hippel & Katz (2002) is toolkits for user-centred innovation. Von Hippel & Katz (2002) stress that traditional product development, where manufacturers first uncover users' needs and then develop responsive products, is insufficient, because the users needs change rapidly. By using toolkits the manufacturers have given up the idea, that they can understand the users need in detail. To illustrate the toolkits they use the pizza as an example, where many aspects of the design such as the dough and the sauce have been made standard, and the user choice has been restricted to the single task of designing the topping. Von Hippel & Katz (2002) found that toolkits for user innovation are applicable to essentially all types of products and services with many different user demands. Von Hippel & Katz (2002) stress some conditions that influence the use of the toolkit: It is important that the toolkit is designed in a way that leaves room for "learning by doing via trial and error", there has to be an appropriate "solution space", the toolkit shall be "user-friendly", there may be module libraries, and lastly there may be a problem in translating user designs into production specifications, because of difference in language, context, elements etc. so the toolkits have to be convertible between user and production.

3.3 Agency and structure: mutual shaping of clients/users and technologies

Since the 1980s it has been argued within science and technology studies (STS), that technology is socially shaped and designed. The point of departure in STS is that technical objects and social relations are bound together and that actors and technology are co-constructed. The distinction between the social and the technical is not given beforehand, but is the result of a mutual shaping process (Bijker et al. 1987; Bijker & Law eds. 1992). Various sociologists and historians of technology have put the image of a modern society created and built by experts, scientist and engineers under pressure. By emphasizing the developments in daily life and the use of new products, the users have been made visible as co-constructors of the modern technology society. In the following some of the different perspectives of the role of the users are described.

Pinch & Bijker (1984) were some of the first to include the users in technology development by introducing the concepts of interpretative flexibility and relevant social groups. In the now classical study of the birth of the bicycle, Pinch & Bijker (1984) illustrate how other perspectives and groups than engineers, designers and scientists enter into the design process by defining problems and develop solutions interpreted through respective technological frames of the groups. The technological frames guide thinking and interaction within and between the different relevant social groups.

Based on a collection of papers from various theoretical starting points, Oudshoorn & Pinch (eds. 2003) attempt to bridge various approaches to the co-construction of users and technology. First, the collection of papers addresses the active role of users as well as resistance and non-use in shaping socio-technical change. Second, focus is on the multiple collectives like advocacy groups and experts who attempt to speak on behalf of the users and the ways in which they represent the diversity of users. Third, focus is turned towards the multiple locations where the configuring of users in the development of technology is taking place. These locations include the design phase of a new technology, testing by clinical trials of drugs and the mediation process between production and consumption, in which mutual articulation and alignment of product characteristics and user requirements is taking place. In sum, although the collection of papers show the creative agency of users in shaping socio-technical change, the studies also show how agency is constrained by government regulations, gender relations etc.

In a previous paper on industrialized single-family house building, Haugbølle & Forman (2006) has shown just how relevant this perspective is for a renewed understanding of the role of the client/user/owner/facility manager etc. as multi-centred. That is, users of single-family houses hold multiple perspectives or focal points which are time-dependent in two ways since they are coupled to the life-cycle of the building as well as the life-cycle of the actor. Further, the different positions will interfere with each other.

4. The case of BELOK: A strategic innovation network

In the following, we will address BELOK as a strategic innovation network dealing with the organization of the network, the development activities being carried out, how the results are being disseminated and the effects of the activities of the network.

4.1 Organization of BELOK

The Swedish government has a national vision of reducing the energy consumption by 20 % from 1995 to 2020 and 50 % from 1995 to 2050. To fulfill this vision, the Swedish Energy Agency has among other means applied a technique procurement strategy (Swedish Energy Agency 2007) as well as cooperation with selected groups of innovative purchasers like BELOK to develop and disseminate energy efficient techniques and methods. Hence, BELOK was established in 2001 on the initiative of the Swedish Energy Agency in collaboration with leading clients and building owners of commercial facilities. The vision, mission and objectives of BELOK are (www.belok.se):

- BELOK is a group of leading building owners carrying out projects on real estate for commercial purposes, which leads the way for reducing energy consumption combined with improved functionality and comfort in the building.
- BELOK supports promising and energy efficient products, systems and methods and create the necessary conditions for implementation and fast introduction to the market.
- BELOK energy solutions must be cost effective, so that the long-term cost balances the energy profit.
- BELOK projects are followed up by evaluation and monitoring the realized energy improvements and their influence on the functionality of the building.

In 2007, 13 commercial real estate owners are members of BELOK, and eight of them have been members since the establishment of BELOK. Five companies are private, two companies are owned by regions and six companies are owned by the government. No members are from municipalities in Sweden. BELOK has got five new members the last five years, and one company has withdrawn its membership in the same period. Although the number of members is fairly small, the 13 BELOK members own 17 % of the total segment of 155 million m² heated area of commercial facilities. Further, the 13 BELOK members own buildings at a total market value of 263 billion SEK, and in 2006 the yearly investment by the 13 BELOK members reached 19 billion SEK or 32 % of the total investment in commercial facilities. Thus, the BELOK members represent a significant share of the market for commercial facilities.

The driving force in BELOK is a group of enthusiastic and committed representatives for owners of commercial facilities supported by a chairman and a secretary, all with high technical, research and commercial competences. Since 2005, BELOK has been hosted by the Swedish Construction Clients Association, which is an organization of about 120 professional private and public owners and landlords in Sweden. The board, called the BELOK Committee, has 8 members including one from the Swedish Energy Agency and one from the Swedish Construction Clients Association.

Since 2005, the BELOK Committee has been responsible for drafting two-year development programs and selecting relevant development projects to be initiated. The latest program covers the period 2007-8 with a total budget of 25 million SEK of which 9 million SEK is granted from the Swedish Energy Agency and the remaining 64 % is financed by BELOK members. Although the two-year programs are formally approved by the Swedish Energy Agency, autonomy is de facto granted to the BELOK Committee to make the decisions regarding new projects etc.

The regular appropriation of new development programs by the Swedish Energy Agency for BELOK and the delegation of professional decision-making to the BELOK Committee have been essential for the success of BELOK. All interviewees highly praise the Swedish Energy Agency for the way they support BELOK and the strategy of using the innovative real estate owners as brokers for implementing new and improved energy technology and methods in the construction and real estate sectors.

Suppliers and participants in BELOK projects support this strongly and add, that BELOK is an excellent venue for meeting new suppliers and ideas, where they have the opportunity to get vital experience in front-running projects and to be accepted by a strong group of buyers. Under normal circumstances it would be impossible for them to penetrate the market so quickly.

4.2 Development activities

It is a characteristic of the innovation process that the majority of projects are primarily based on 'a good idea' developed by technicians, based on technically based research and in close collaboration between the main partners in the supply chain and the professional customer – the owner and member of BELOK. This practice, however, has a number of implications.

First, the development projects initiated by BELOK can be divided into two main categories. Until today, BELOK has launched 15 technical product-oriented projects and 8 process-related development projects. Technical projects like the development of HVAC installations and glass façade systems dominate the portfolio of development projects. Among others, the technical projects include:

- Office building with glass facades.
- Ventilation with variable air flow.
- Electro filter in ventilation.

- Chilled beam systems in cooling towers.
- Consumption of electricity.
- Control and monitoring systems.

Management and process-related projects play a smaller role in BELOK compared with technical product projects. Among others, the process-related projects include:

- BV²-Arch - Energy design of building.
- Demands and specifications.
- Energy management and declaration.
- Tenancy contracts with incentives.

BELOK has put less effort into the process-related projects compared with the technical product-oriented projects, and the evaluation indicates that process projects are more complicated for BELOK to implement. Improved and more efficient processes are a supplement to product development and supporting the dissemination of new energy efficient technologies. It is therefore important for BELOK to improve the process developments in the future. Thus, a challenge for BELOK could be to improve the processes by putting more focus on the needs of the individual target groups and to fulfill specific objectives for development of communication, competence and energy efficient attitudes.

Second, the type of innovations addressed by BELOK tends to be incremental in nature, thereby reducing the associated risk for the involved actors. All development and demonstration projects are based on a solid technical research background, and they are only initiated if they appear to be ready for introduction on the market. More risky projects are seldom initiated, and at least once BELOK felt obliged to stop a project because it did not rest on solid technical ground and was not mature for market introduction.

Third, certain perspectives like the perspective of end-users are largely left out of sight due to the close collaboration with the main partners in the supply chain. All development and demonstration projects are based on a solid research background, and they are executed mainly by technicians and researchers. The documentation and information are aimed at the same group. It is noticeable that far less attention has been paid to the operational end-user in facilities management, how to improve the design and construction process, and how the results could be disseminated to other owners, internally in BELOK companies as well as to other consultants, contractors and suppliers. The result is that more simple and user-oriented information materials is lacking regarding state-of-the-art and actions to be taken for others than the front-runners and the technicians.

4.3 Dissemination

When looking at the dissemination activities of the BELOK network it is worth considering which groups are the target groups of dissemination and information activities. Six target groups may be identified:

- 1. Internally in BELOK companies.
- 2. Between BELOK members.
- 3. Other owners and projects.
- 4. Researchers, universities and schools.
- 5. Technical suppliers.
- 6. Consultants and contractors.

BELOK has carried out a number of dissemination activities, but the predominant method is through internal meetings aimed at the members of BELOK. The stability and commitment of participants in the work of BELOK is noticeable. Since the start of BELOK in 2001, 28 meetings have been held. Seven persons have participated in 75 % or more of these meetings, and they include the chairman, the secretary and the representative of the Swedish Energy Agency. The last four old member companies have participated in around 50 % of the meetings. Three of the new members have participated in 75 % or more of the meetings since becoming members of BELOK, and the last two new members have participated in around 50 % of the meetings. Eight member companies have been represented by only one person in the BELOK meetings, and the rest has been represented by two to four persons.

Frequent interaction is ensured by two-day meetings four times a year, where ideas are turned into action and development projects in an open and friendly atmosphere between professional colleagues. Especially the person to person discussions and exchange of experiences during breaks and in the evening are important. Several interviewees expressed the importance of the informal discussions between the members and the Swedish Energy Agency, and that the Swedish Energy Agency are faithful participants at both BELOK meetings and the BELOK Committee. It is also important that decisions are made on technical and professional grounds and linked directly to demonstration projects and developments on site. Some

interviewees even considers the meetings and the professional contacts and discussions as their most important training venue as innovative owners.

Whereas commitment and frequent interaction marks the internal dissemination of results and lessons learned, the external dissemination to actors outside BELOK tends to be more random hitherto. Results and lessons learned from the development of techniques, products and processes are important to disseminate to the individual partners in the sector if the effect should be measurable not only in the development projects but in all commercial facilities in Sweden. Although BELOK recognize the importance of external dissemination to other actors in the construction and real estate cluster, there does not seem to be a clear strategy and operational plan for dissemination from the creative and innovative members in BELOK to other building owners, consultants, suppliers etc. The BELOK website is the main channel for disseminating information from BELOK, but also seminars and competitions on technique procurement are channels for dissemination. However, BELOK does not use e.g. newsletters or professional trade courses as means to communicate results and lessons learned.

First, the BELOK website gives information on all finished projects and projects in progress. Specific tools like BELOK life cycle costs calculation and early energy calculation for architects – BV²-Arch – can be downloaded free of charge. Common demands and specifications on indoor climate, energy and control and monitoring systems can also be downloaded from the website free of charge. The website also contains a list of members and the description of the BELOK organization with contact addresses. On the front page latest news and cross-reference to the archives of news are given. Managing and updating the website regularly has turned out to be more challenging than anticipated. Thus, BELOK has now hired an external supplier to help improve the website with a monthly updating.

Second, the number of public seminars held by BELOK in 2006 and 2007 has been modest. On the website, information is given on two seminars held in September 2006 and in May/June 2007. The first seminar discussed results on daylight and sun shutters. The second seminar discussed energy consumption, indoor climate, daylight and life cycle cost in glass office buildings. No information is given on the website on new seminars, workshops or site visits to be held in 2007 or 2008.

The third dissemination channel for BELOK is the technique procurement and the announcement of a competition, the winner and the winning project. The competition is part of the technical procurement method that the Swedish Energy Agency uses to improve energy efficient methods and new techniques (Swedish Energy Agency 2007, Persson 2004), and it is followed up by installation, testing and evaluation. BELOK has completed two competitions: one competition on BV²-Arch and one on control and monitoring systems. The competition on technique procurement proves to the market that BELOK is an important player in the development of commercial building and demonstrates in practice the vision for future techniques, product, tools and processes. At the same time the innovative owners demonstrate their willingness to make energy efficient decisions and buy new energy efficient techniques and processes. The interviewees gave the impression of a successful process that was completed and reported in a professional way but with a number of practical challenges for future improvement like readiness of technologies, sufficient number of competitors and the specifications and the evaluation methods must be documented in advance and fit for the owner and consultant in the decision process.

4.4 Effects

The previous chapters have dealt with the first three out of four bullet points regarding the vision, mission and objectives of BELOK. Now, the attention will be turned towards the last bullet point stating that BELOK projects are followed up by evaluation and monitoring the realized energy improvements and their influence on the functionality of the building.

BELOK is facing a serious challenge of measuring and documenting the overall effect of BELOK and the individual development projects. Scrutinizing the few reports from the finished projects, reveal a number of problems in assessing the results, fixing the reference points and calculating the specific and future cost and energy savings compared with traditional techniques and processes. A similar observation was reported in 2006 by Lars J. Nilsson (AID-EE EU project 2006a) in a European study on energy efficiency policies (AID-EE EU project 2006b & 2006c).

The observed and reported problems of measuring the effect of the finished projects stems from earlier phases of the project, when the development projects were formulated and selected. In the selection process, measurable targets for energy improvements, indoor climate and cost reductions ought to be set if consistent assessments are to be carried out at the end of a project. Further, it should be described how it could be tested in the process and the delivery of the product. However, some of the BELOK projects set vague targets for energy consumption, and only a few of them describe the investments and savings in costs in a measurable way.

Thus, there appears to be little overall reflection on the cost-effectiveness of the individual development project. Often key issues related to dilemmas of investment cost versus life cycle costs as well as reduction of energy consumption versus improved indoor climate are not sufficiently dealt with in the project proposals. Further, the development projects are not primarily initiated because they add substantially to the fulfillment

of objectives set in the national vision for energy consumption. Instead 'the good idea' and the technical maturity are more important concerns. Consequently, the initiated development projects do not necessarily provide 'best value for money' when it comes to parameters like low investment costs, quick dissemination, large reduction in energy consumption and large market shares.

The current situation is quite understandable. If BELOK starts claiming measurable targets for improvement in the energy consumption and long-term cost compared with a traditional technique and process, the energy and cost targets together with other performance parameters must be evaluated and reported in a systematic way by the owner and supplier. However, such a system for consistent and systematic evaluations does not exist at present. Thus, an important challenge for BELOK could be to develop simple and cost effective methods for different types of evaluations.

5. Conclusion

This study has analyzed how a group of clients have formed a strategic innovation network in order to act as change agent in the construction and real estate industry cluster with respect to improving energy performance of commercial facilities. The study has shown that clients **can** act as a change agent in order to reduce energy consumption in buildings, but not all strategies and tools are equally successful and appropriate. A number of observations lead to four lessons learned regarding **how** the client acts as change agent.

First, the driving force in BELOK is a group of enthusiastic and committed representatives for owners of commercial facilities, which represent a significant share of the market. The delegation of professional decision-making power and the regular appropriation of new development programs from the Swedish Energy Agency to BELOK have been essential for the strategy of using the innovative real estate owners as brokers for energy efficient technologies in the construction and real estate cluster. Suppliers and other participants in BELOK projects add that BELOK is an excellent venue for acquiring new vital experience in front-running projects and to be accepted by a strong group of buyers. Thus:

Lesson no. 1: If a strategic innovation network based on strong personal commitment is linked together with regular appropriation of public funding and decision-making power, (some) clients can and will act as change agents in the construction and real estate cluster.

Second, the study has shown that the innovation process is primarily based on 'a good idea' developed by technicians, based on technically based research and in close collaboration between the main partners in the supply chain and the professional client. Some of the implications of this practice are: less effort into the process-related development projects, risk reduction and largely leaving out of sight certain perspectives of e.g. end-users. Thus:

Lesson no. 2: Clients are likely to undertake technical product-oriented and incremental innovations rather than process-related and/or radical innovations.

Third, the internal dissemination activities of BELOK are strongly supported by the small, stable and committed group of actors along with the frequent interaction of that group. The external dissemination activities are, however, more random in character. That raises an important strategic question of what role should BELOK play as change agent: Do clients as change agents pull the rest of clients and/or do they push the supply chain? And how will they do that – by outdoing other actors, by active involvement of other actors, or by informing other actors of results and showing alternative routes? Clients need to be very aware of the differences and how they e.g. communicate in the different settings. Thus:

Lesson no. 3: In the role as change agent, clients need to carefully observe the balance between the double ambition of pulling/pushing the supply chain and pushing/pulling other clients.

Fourth, BELOK is at present faced with the challenge of measuring and documenting the overall effect of BELOK and the individual development projects. Targets and results are not sufficiently set and described in a systematic manner, and there appears to be little overall reflection on the cost-effectiveness of the individual development project. Instead 'the good idea' and the technical maturity are more important concerns. Consequently, the initiated development projects do not necessarily provide 'best value for money'. Thus:

Lesson no. 4: The engagement of 'the good idea' needs to be linked closely with strategic objectives and systematic assessment of effects.

In conclusion, BELOK pull the innovation in the real estate market and in the construction sector supported by universities by formulating common demands and specifications for better products, processes and knowledge. They implement new and better products and processes, and by good examples they demonstrate the effect on improved energy efficiencies, indoor climate and the long-term economy for the owner and end-user. They are also playing a role in the dissemination from the best owners to the rest of the

real estate market, and to the construction and building products markets through supporting the best and most innovative consultants, contractors and producers.

References

- AID-EE EU-project (2006a). *Evaluation of Belok (Procurement group for Commercial Buildings – Sweden)*. Active Implementation of the European Directive on Energy Efficiency (AID-EE). www.aid-ee.org. March 2006.
- AID-EE EU-project (2006b). *Success and Failure in Energy Efficiency Policies – Ex-post Evaluation of 20 Instruments to Improve Energy Efficiency Across Europe*. Active Implementation of the European Directive on Energy Efficiency (AID-EE). www.aid-ee.org. March 2006.
- AID-EE EU-project (2006c). *Guidelines for monitoring, evaluation and design of energy efficiency policies – How policy theory can guide monitoring & evaluation efforts and support the design of SMART policies*. Active Implementation of the European Directive on Energy Efficiency (AID-EE). www.aid-ee.org. October 2006.
- Bijker, W. E., Hughes, T. & Pinch, T. (1987). *The Social Construction of Technological Systems*. Cambridge, MA: MIT Press.
- Bijker, W. E. & Law, J. (1992). *Shaping Technology/Building society – Studies in Sociotechnical Change*. Cambridge, MA & London, England: MIT Press.
- Brown, K., Hampson, K. & Brandon, P., 2006, *Clients Driving Construction Innovation: Moving Ideas Into Practice*, (Australia: Icon.Net Pty Ltd).
- Brown, K., Hampson, K. & Brandon, P., 2005, *Clients Driving Construction Innovation: Mapping the Terrain*, (Australia: Icon.Net Pty Ltd).
- Dodgson, M., Gann, D. M. & Salter, A. J. (2002). The Intensification of Innovation. *International Journal of Innovation Management*, Vol. 6 (1), 53-83.
- Edler, J. & Georghiou, L. (2007). Public procurement and innovation – Resurrecting the demand side. *Research Policy*, Vol. 36, 949-963.
- Gann, D. M., 2002, *Building Innovation: Complex Construct in a Changing World*, (London: Thomas Telford Services Ltd).
- Gann, D. M. & Salter, A. J. (2000). Innovation in project-based service-enhanced firms: the construction of complex products and systems. *Research Policy*, Vol. 29, 955-972.
- Haugbølle, Kim & Forman, Marianne (2006). The Co-Construction of Clients, Concepts and Companies. I: Pietroforte, Roberto; De Angelis, Enrico & Polverino, Francesco (eds.). *Construction in the XXI Century: Local and global challenges*. Rome: CIB & ArTec. pp. 1-12. Full papers.
- IVA – Kung. Ingenjörsvetenskapsakademien/Swedish Academy of Engineering Science (1997). *Kompetensutveckling inom samhällsbyggnad. Byggherren i fokus*. Stockholm: IVA.
- Manseau, A. & Seaden, G. (eds. 2001). *Innovation in Construction. An International Review of Public Policies*. London & New York: Spon Press.
- Oudshoorn, N. & Pinch, T. (eds. 2003). *How Users Matter. The Co-Construction of Users and Technologies*. Cambridge, MA & London, England: The MIT Press.
- Pinch, T. J. & Bijker, W. E. (1984). The social construction of facts and artifacts. *Social Studies of Science* Vol. 14: 399-431.
- Rowlinson, S. & McDermott, P. (eds. 1999). *Procurement systems. A guide to best practice in construction*. London/New York, USA: E & FN Spon/Routledge.
- Swedish Energy Agency/Energimyndigheten (2007). *Vad är en teknikupphandling?* Energimyndigheten, www.energimyndigheten.se /Råd och tips – företag/Teknikupphandling, 2007-08-08.
- von Hippel, E. (1986). Lead Users: A Source of Novel Product Concepts. *Management Science*, 32 (7), 791-805.
- von Hippel, E. & Katz, R. (2002). *Shifting innovating to users via toolkits*. MIT Sloan School of Management. Working Paper No. 4232-02.
- www.belok.se